SECRET

CAPC 2464
COPY 1 OF 1

4 November 1955

CMCC Doc. No. 151.725
Copy 1 of 2
Page 1 of 1

Dear Dick:

We are forwarding herewith five copies of Monthly Progress Report No. 5 covering the work performed on System No. 3 during the period extending from 4 September to 4 October 1955. Progress on the development of this system appears to be most satisfactory.

Sincerely,

Burt

Burt

Enclosures:
CMCC Doc. No. 163.2016
Copies 1-5 of 7

SECRET

SECRET

SAPC-2464/A
cy 1 of 5

Monthly Progress Report No. 5

System No. 3

Contract No. A-101

4 September 1955 to 4 October 1955

CMCC Document No. 163.2016

Copy 1 of 7

This document contains information affecting the National Defense of the United States within the meaning of the Espionage Laws, Title 18, U.S.C., Sections 793 and 794. Its transmission or the revelation of its contents in any manner to an unauthorized person is prohibited by law.

SECRET

Approved For Release 2002/06/13 : CIA-RDP81B00878R000300060026-0

1-0. INTRODUCTION.

25X1D

25X1D

[redacted] Requirements of the system, and design methods proposed to meet these requirements, have been outlined in previous reports. This report describes the status of the system, and the progress made during September.

1-2. The major effort during the period covered by this report was applied to the breadboard model. Work was also devoted to experimental design of the system components, as well as to modification of earlier component design. Two factors are influencing the changes in component design: (1) performance deficiencies revealed by testing the breadboard model, and (2) a system change requested by the customer.

2-0. ANTENNA.

2-1. Several types of antennas have been evaluated in an effort to obtain optimum response to both vertically and horizontally polarized waves. Two antenna models have displayed directional characteristics which were acceptable when tested in the 20:1 model of the aircraft. One antenna model which proved satisfactory consisted of a two-turn loop, mounted horizontally and placed flush with the aircraft skin. When backed by a shallow cylindrical cavity, the sensitivity of the loop to vertically polarized waves is comparable to its sensitivity to horizontally polarized waves. The acceptable sensitivity to vertically polarized waves was predicted on the basis of earlier experiments. The experiments showed that the electric field existing between the loop and the reflecting surface provided a strong dipole effect. Additional work on the U-slot antenna configuration (described in paragraph 2 of Report No. 4) has resulted in increased sensitivity of the antenna to horizontally polarized waves. Acceptable performance was achieved by lengthening the U-slot, and by adjusting other dimensions.

2-2. During the next report period, both types of antennas will be tested using the half-scale model of the aircraft nose section. The model of the aircraft nose section has been installed in a specially constructed jig for the purpose of measuring antenna impedance. The impedance characteristics of the U-slot antenna will be examined first.

3-0. R-F ASSEMBLY.

3-1. Additional tests were performed on the wide-band r-f preamplifier, and changes in circuit layout were found necessary due to the presence of r-f voltages at unwanted locations. A new preamplifier was built and tested. The frequency-response and gain characteristics of the new unit are shown in figure 1.

3-2. Work on the r-f heads has been delayed because the set of crystals for the first local oscillator (paragraph 3-2, Report No. 4) have not been received from the supplier. It is expected that the crystals will be received, and work on the r-f heads will be resumed, in the near future.

4-0. I-F ASSEMBLY.

4-1. After preliminary modification of the i-f assembly, evaluation tests were conducted. The tests revealed the unit's susceptibility to the generation of spurious frequencies, and further modifications are required. Present plans call for three basic changes: (1) the single-ended mixers will be replaced by balanced mixers, (2) trap circuits will be added to the first two i-f amplifier stages, and (3) the frequency of the third i-f section will be raised from 1 mc to 1.5 mc. The fabrication of militarized subminiature i-f transformers has been discussed with the Automatic Manufacturing Corporation, and it appears that the company will be able to supply units which fulfill our requirements.

4-2. During this report period, the i-f assembly, second local-oscillator assembly, and third local-oscillator assembly were operated as a system. Lock-on operation occurred at the correct signal level (ten microvolts applied to the input of the i-f assembly). The operation of the complete scanning operation, including sweeping and crystal-oscillator stepping, was successful.

5-0. SECOND LOCAL-OSCILLATOR ASSEMBLY.

5-1. The final breadboard of the electronic commutator for the second local-oscillator assembly has been built. This commutator, composed of a diode matrix and flip-flop counters, uses silicon crystal diodes and silicon transistors throughout. The unit has been subjected to ambient temperatures up to 115°C. The tests did not indicate any degeneration of performance in either stability, or in tolerance to supply and pulse voltage variations.

5-2. The final breadboard model of the crystal oscillator has been completed, operation of the commutator and oscillator has been tested, and the frequency-stepping procedure is satisfactory. The oscillogram of figure 2 shows (a) the output of the sweep generator (part of the third local-oscillator assembly), and (b) the 16 output frequencies of the crystal oscillator. The same information is shown in the oscillogram of figure 3, using an expanded scale (1-millisecond/scale-division). Figure 3(b) shows the dead time (approximately 1.5 milliseconds) during which one crystal oscillation dies away, and the build-up of the following crystal oscillation occurs. Figure 3(a) shows the quiescent condition of the sweep voltage during this interval. Design work has started on the etched board to be used in the prototype model of the second local-oscillator assembly.

6-0. THIRD LOCAL-OSCILLATOR ASSEMBLY. When the third local-oscillator was tested in conjunction with related assemblies, the necessity for additional modifications was revealed. Accordingly, the sweep range will be increased approximately 10%, and the possibility of replacing the 1-mc booster amplifier with a d-c amplifier is under consideration. The d-c amplifier would be fed by the second detector in the i-f assembly. The change would produce two desirable effects: (1) feedback between units would be reduced, and (2) a simpler discharge circuit could be used in restoring maximum receiver sensitivity after a lock-on interval. The discharge circuit will be incorporated into the system as a means of rapidly restoring the agc bus to the zero signal condition.

7-0. PLAYBACK UNIT.

7-1. A significant change in the design of the playback system has resulted from the customer's request to include facilities for determining the time interval between events which are recorded on the tapes of System 1 and System 3. It is necessary to determine this time interval with an accuracy of 0.1 second. A study is being made of the changes in design required to provide the additional feature.

7-2. Circuit design and construction has continued on the following: preamplifier, skimmer, and several flip-flop circuits in the pulse separator section.

8-0. TEST UNIT. Construction of the test-function generator was completed, but initial tests indicated that modifications were required. The necessary modifications are being incorporated in the generator.

9-0. RECEIVER PACKAGING. To facilitate fabrication during the production stage, plans for construction of the receiver case have been modified. Instead of employing shielded compartments within the receiver case, the assemblies will be shielded individually by light weight covers. Details of the case assembly are being formulated.

10-0. SUMMARY. The design and construction of all parts of the airborne equipment are approaching completion. It is expected that some minor modifications will be required in the future, when more comprehensive tests reveal performance deficiencies. One of the assemblies (second local-oscillator) has entered the prototype stage. The remaining assemblies comprising the airborne receiver are scheduled to enter the prototype stage during the next report period.

25X1D

Approved For Release 2002/06/13 : CIA-RDP81B00878R000300060026-0

(a)

(b)

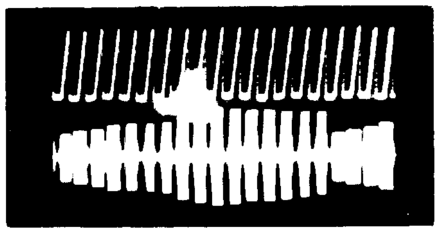

Figure 2. Sweep-Generator Waveform and Corresponding Oscillator Output.

(a)

(b)

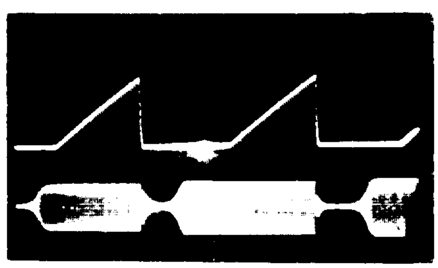

Figure 3. Expanded View of Figure 2.

SECRET

Approved For Release 2002/06/13 : CIA-RDP81B00878R000300060026-0